Level 3 Certificate
MATHEMATICAL STUDIES

Paper 1

Name: _____

Class: _____

Date: _____

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- a clean copy of the Preliminary material
- a scientific calculator or a graphics calculator
- a copy of the formulae sheet
- a ruler.

Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in your name, class and the date at the top of this page.
- Answer all the questions.
- Do all rough work on this paper. Cross through any work that you do not want to be marked.
- In all calculations, show clearly how you work out your answer.
- The final answer to questions should be given to an appropriate degree of accuracy.
- You may not refer to the copy of the Preliminary material that was available prior to this examination. A clean copy is enclosed for your use.

Information

- The maximum mark for this paper is 60.
- The marks for each question are shown in brackets [ ].
- Use this as a guide as to how much time to spend on each question.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Question	Mark
1	
2	
3	
4	
5	
6	
7	
Total	

OXFORD

Paper 1

1 A travel company sells holidays for single people in France, Spain and Italy.
The table shows the number of people who went on each of these holidays last year.

Country	France	Spain	Italy
Number of people	246	354	119

The travel company contacts three people who went to each country to find out their opinions on the holidays.

a) Give two reasons why this is not a good sample of people to take.

[2 marks]

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b) Give a full description of a better sampling method the company could use.

[4 marks]

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2 Jack pays for a laptop costing £790 with a credit card.
The credit card company charges 1.2% interest each month.

Jack pays back £150 at the end of each month until the remaining balance is less than £150.
At this point he immediately pays off the remaining amount to avoid any additional interest.

a) Explain why the remaining balance after n months, $£B_n$, is given by the recurrence relation

$$B_n = 1.012B_{n-1} - 150, \text{ where } B_0 = 790$$

[2 marks]

b) Complete a copy of the table to give Jack's remaining balance at the end of each month until his account is settled.

Assume that the balance at the end of each month is rounded to the nearest penny.

[2 marks]

n	B_n
0	790
1	649.48
2	
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7	

c) Calculate how much Jack pays for the laptop.

[2 marks]

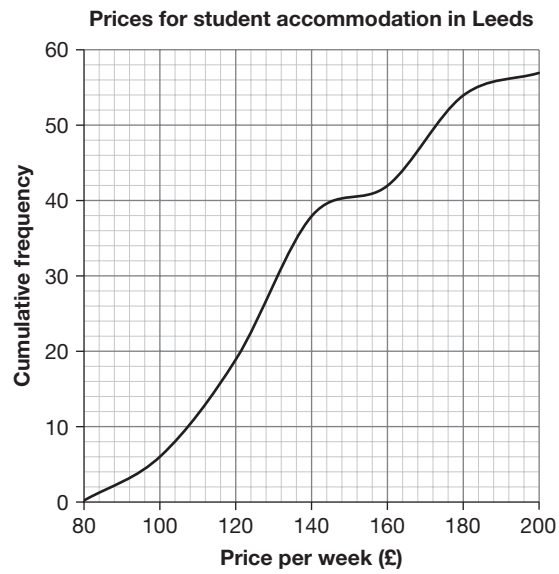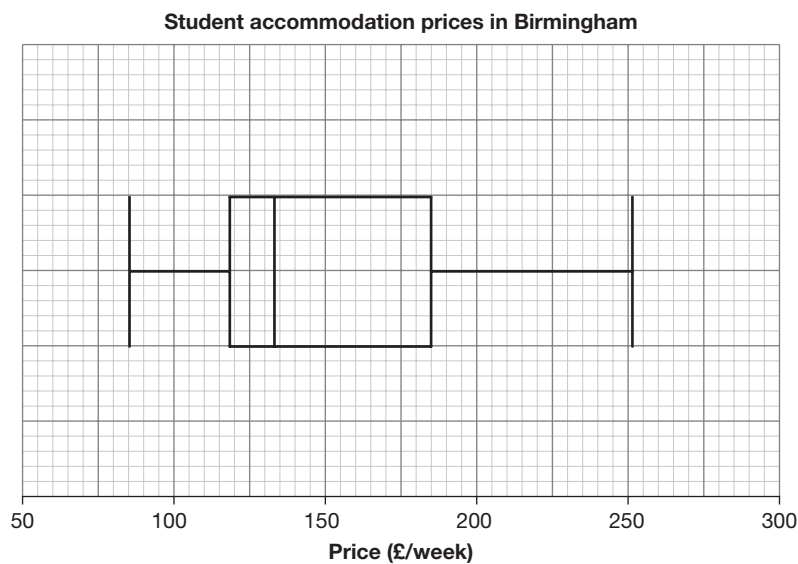**d)** Write the interest Jack has paid as a percentage of the original price of the laptop.

[2 marks]

3 Kate and Will are studying student accommodation prices at universities that interest them.

Kate draws this cumulative frequency graph of student accommodation prices in Leeds.

Prices for student accommodation in Leeds

Will draws this boxplot of student accommodation prices in Birmingham.

Student accommodation prices in Birmingham

a) Use the diagrams to compare the distributions of student accommodation prices.

[7 marks]

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b) Will says that some of his prices included breakfast and an evening meal.

Give rough calculations to estimate how much these would cost a student per week if they were not included.

[3 marks]

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4 Use **Taxation 2015–16** on the Preliminary Material.

During the year 2015–16, Tao was employed on a monthly salary of £1980.
She had a personal tax-free allowance of £10 600.
She paid National Insurance at the non-contracted out rate.

To the nearest £10, Tao saved $\frac{1}{5}$ of her monthly take home pay each month.
How much did Tao save each month?

[8 marks]

5 a) Oliver invests £1600 in a **Bonus** savings account.
The compound interest rate is fixed at 2.8% per year.
What will be the value of the investment after five years?

[2 marks]

b) Oliver sees an advertisement for an **eSaving** account.

eSaving		
Net	**Gross**	**AER**
2.37%	2.96%	3.00%
Interest added monthly.		

i Which of the three interest rates should Oliver compare with the rate he gets from the **Bonus** savings account?

[1 mark]

ii Give calculations that show that a gross interest rate of 2.96% added monthly is equivalent to an AER of 3.00%.

[4 marks]

6

The table gives the size of the electorate in constituencies that elected a Conservative Member of Parliament in 2015.

The histogram shows the data for constituencies that elected a Labour Member of Parliament.

Electorate (thousands)	Number of Conservative constituencies
$x \leq 45$	0
$45 < x \leq 60$	9
$60 < x \leq 65$	18
$65 < x \leq 70$	63
$70 < x \leq 75$	113
$75 < x \leq 80$	84
$80 < x \leq 85$	35
$85 < x \leq 90$	7
$90 < x \leq 110$	2

Electorate size in 2015 Labour constituencies

Use the given data to comment on the content of the newspaper cutting.

Show your working below. You may wish to use one or both grids.

[10 marks]

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7 **a)** A water company records the amount of water used by each household.

What type of data is collected by the water company?
Circle all of the terms that apply:

continuous   discrete   primary   secondary

[2 marks]

b) You may use **Collecting rainwater** on the Preliminary Material.

The water company asks householders in a small town to save water during the summer months from June to September (inclusive). They suggest that each householder collects rainwater from their roof where possible.

Estimate the total amount of rainwater householders in the town may be able to collect from June to September (inclusive).

Show details of your assumptions and calculations.

[9 marks]

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